49. (Amended) A method of manufacturing a catadioptric optical system according to Claim 42, wherein said refraction type optical system includes two kinds of glass material.

Please cancel Claim 50 without prejudice.

58. (Amended) A catadioptric optical system according to Claim 51, wherein said catadioptric type optical system includes a lens group including at least one lens element whose surface is aspherical, and said refraction type optical system includes at least one lens element whose surface is aspherical.

REMARKS

Favorable reconsideration of this application, as amended, is respectfully requested.

The allowance of Claims 18-28, 30, 31, 33-38, 42, 44-49, and 51-62 is noted with appreciation.

Allowed Claims 24, 36, 46, and 58 have been amended to change the term "asymmetric" to --aspherical--, as was intended. See, e.g., the paragraph bridging pages 17-18 of

the specification and Table 1 on the following pages, Table 2 on pages 23-26, and Table 3 on pages 27-32.

Allowed Claims 47 and 48 have been amended to change the preamble to recite a method of manufacturing a catadioptric optical system. It is apparent from the body of these claims that these claims were intended to be method claims. The error in the preamble occurred when these claims were originally presented as claims dependent upon base Claim 42, which is a method claim.

It is apparent that the amendment of the allowed claims does not detract from their allowability.

Without acceding to the rejection of Claim 50, this claim has been cancelled to expedite the allowance of this application.

The rejection of Claims 29, 32, 39 and 40 under 35 U.S.C. § 102(b) as being anticipated by Furter is respectfully traversed. The rejection alleges that Furter forms an intermediate image. However, no intermediate image is formed in Furter. In Fig. 1 of Furter, light from an object surface reflected by a second mirror 19 forms an image on a second plane 36 without forming an intermediate image.

Independent Claim 29 recites, inter alia, a catadioptric optical system and a refraction type optical system. The catadioptric type optical system forms an intermediate image from an object of a first plane surface, and the refraction type optical system forms an image of light coming directly from a second reflecting surface. Since Furter does not form an intermediate image, it is apparent that Claim 29, as rejected, distinguishes patentably from Furter. Although not required by the rejection, Claim 29 has been amended to further clarify the invention intended to be claimed.

Claim 29 has been amended to recite a refraction type optical system for forming a final image of light coming from the object after twice reflected by the first and second reflecting surfaces and directly from the second reflecting surface, onto a second plane surface which is substantially parallel to the first plane surface. If the image formed on the second plane in Furter were considered to be an intermediate image (which it is not), there would be no final image formed as recited in Claim 29.

Accordingly, Claim 29 and dependent Claims 32, 39, and 40 are clearly allowable.

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This application is now believed to be clearly in condition for allowance.

A marked-up copy of the amended claims is attached.

The Commissioner is hereby authorized to charge to Deposit Account No. 50-1165 any fees under 37 C.F.R. §§ 1.16 and 1.17 that may be required by this paper and to credit any overpayment to that Account. If any extension of time is required in connection with the filing of this paper has not been requested separately, such extension is hereby requested.

Respectfully submitted,

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Marked-Up Copy of Claims -- 09/615,081

24. (Twice amended) A catadioptric optical system according to Claim 18, wherein said catadioptric type optical system includes a lens group including at least one lens element whose surface is [asymmetric] aspherical, and said refraction type optical system includes at least one lens element whose surface is [asymmetric] aspherical.

29. (Twice amended) A catadioptric optical system comprising:

a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

a refraction type optical system for forming [an] a final image of light coming from said object after twice reflected by said first and second reflecting surfaces and

directly from said second reflecting surface, onto a second plane surface which is substantially parallel to said first plane surface,

wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface.

36. (Twice amended) A catadioptric optical system comprising:

a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface,

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wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein said catadioptric type optical system includes a lens group including at least one lens element whose surface is [asymmetric] aspherical, and said refraction type optical system includes at least one lens element whose surface is [asymmetric] aspherical.

46. (Twice amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface,

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wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein said catadioptric type optical system includes a lens group including at least one lens element whose surface is [asymmetric] aspherical, and said refraction type optical system includes at least one lens element whose surface is [asymmetric] aspherical.

47. (Twice amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface,

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wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and

wherein at least one of said first and second reflecting surfaces is a concave reflecting surface that corrects positive Petzval sum created by said lens element.

48. (Amended) A method of manufacturing a catadioptric optical system comprising:

providing a catadioptric type optical system, which includes a lens element, a first reflecting surface and a second reflecting surface that reflects light coming from said first reflecting surface, light coming from said second reflecting surface passing said first reflecting surface off-axis thereof, at least one of said first and second reflecting surfaces being a concave reflecting surface, for forming an intermediate image from an object of a first plane surface; and

providing a refraction type optical system for forming a second image onto a second plane surface which is substantially parallel to said first plane surface,

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wherein, said catadioptric type optical system and said refraction type optical system are disposed between said first plane surface and said second plane surface, and wherein the catadioptric optical system has both-sides telecentricity.

49. (Amended) A method of manufacturing a catadioptric optical system according to Claim 42, wherein said refraction type optical system includes two kinds of glass material.

58. (Amended) A catadioptric optical system according to Claim 51, wherein said catadioptric type optical system includes a lens group including at least one lens element whose surface is [asymmetric] aspherical, and said refraction type optical system includes at least one lens element whose surface is [asymmetric] aspherical.